HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

PATENT APPLICATION

ATTORNEY DOCKET NO. 200309593-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	**Peter Mardilovich et al.**	**Confirmation No.:**	**5931**
Application No.:	**10/629,116**	**Examiner:**	**LEE, Cynthia K.**
Filing Date:	**July 28, 2003**	**Group Art Unit:**	**1795**

Title: Fuel Cell Support Structure and Method of Manufacture

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on November 20, 2008 .

☒ The fee for filing this Appeal Brief is $540.00 (37 CFR 41.20). - minus $500.00 per previously filed Appeal Brief dated April 4, 2007.

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $130	☐ 2nd Month $490	☐ 3rd Month $1110	☐ 4th Month $1730

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 40 . At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

Respectfully submitted,

Peter Mardilovich et al.

By /Steven L. Nichols/

Steven L. Nichols

Attorney/Agent for Applicant(s)

Reg No. : 40,326

Date : November 20, 2008

Telephone : 801-572-8066

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Patent Application of

Peter Mardilovich et al.

Application No. 10/629,116

Filed: July 28, 2003

For: Fuel Cell Support Structure and Method of Manufacture

Group Art Unit: 1795

Examiner: LEE, Cynthia K.

Confirmation No.: 5931

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to Appellants' filing of an Appeal Brief on 23 May 2008, the Examiner has again reopened prosecution with a non-final Office Action dated 21 August 2008 (the "Office Action" or the "Action"). Having reviewed the new grounds of rejection raised in the latest Office Action, Appellants again request reinstatement of the appeal in this application and file the present, updated Appeal Brief, along with a new Notice of Appeal, in support of the re-instated appeal.

Previously, in response to an earlier Appeal Brief filed 26 April 2007, the Examiner of this application reopened prosecution with a non-final Office Action dated 11 July 2007. Appellants again attempted to receive a hearing on appeal by filing a reinstated Appeal Brief

on 3 December 2007. However, the Examiner once again reopened prosecution with a non-final Action dated 25 February 2008. In response, Appellants filed the Appeal Brief of 23 May 2008, mentioned above.

Appellant notes that, if the Examiner continues to reopen prosecution for the slightest of reasons, Appellant is effectively denied the right to an appeal. Appellant now hopes for a hearing before the Board of Patent Appeals and requests that, in fairness, this matter be passed to the Board.

I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. Related Appeals and Interferences

There are no appeals or interferences related to the present application of which the Appellants are aware.

III. Status of Claims

Claims 1-48 have been cancelled. Claims 49-84 are pending in the application and stand finally rejected. Accordingly, Appellants appeal from the final rejection of claims 49-84, which claims are presented in the Appendix.

IV. Status of Amendments

No amendments have been filed subsequent to the final Office Action of 15 December 2006 or the latest non-final Office Action dated 21 August 2008, from which Appellants take this appeal.

V. Summary of Claimed Subject Matter

Fuel cells conduct an electrochemical reaction with reactants such as hydrogen and oxygen to produce electricity and heat. (*Appellants' specification, paragraph 0001*). A typical fuel cell includes an electrolyte disposed between an anode and a cathode. (*Appellants' specification, paragraph 0002*). Appellants' specification describes a fuel cell support structure for the anode, cathode and electrolyte, and methods for fabricating fuel cell support structures. According to one exemplary implementation, a fuel cell support structure includes a self-organized ceramic substrate in which nanopores of selected morphology are defined. (*Appellants' specification, paragraph 0024*).

With reference to Appellants' Fig. 1, a fuel cell (100) generally includes a support structure (110), an electrolyte (120), an anode (130), and a cathode (140). The fuel cell support structure (110) supports the electrolyte (120), the anode (130), and/or the cathode (140). Fig. 1 illustrates an exemplary implementation of a dual chamber fuel cell (100) utilizing a self-organized nanoporous ceramic fuel cell support structure (110). As used herein, the term "self-organized" refers to the property of the material from which the support structure is made to form parallel nanopores when the support substrate is grown, micromachined or etched as described below. The support structure may be formed, for example, from anodic alumina. In the illustrated implementation, a dense layer of electrolyte (120) is disposed in the pores (150) in the support structure (110). Further, the anode (130) and the cathode (140) are disposed on opposing sides of the support structure (110), being separated by the support structure (110) and the deposited electrolyte (120). Thus, the combination of the support structure, the electrolyte (120), the anode (130) and the cathode (140) separate the two chambers of the fuel cell system (not shown). The structure and operation of the dual chamber fuel cell will be described in more detail below with reference

to Figs. 9-11. For dual chamber systems, efficiency may be affected by the need to seal two chambers from each other and by the ability to transfer ions from the cathode across the electrolyte to the anode. Precise control of the porosity characteristics of a support structure may allow for more precise formation of the electrolyte and/or electrodes on the support structure while providing for improved diffusion. (*Appellants' specification, paragraph 026*)

Turning to specific claims:

Claim 49 recites:

A fuel cell comprising:

a ceramic support substrate (110) supporting a cathode (140), anode (130) and electrolyte (120) (*Appellants' specification, paragraph 026*); and

a plurality of pores (150) formed through said substrate (110), said pores (150) having a size that varies in diameter through a thickness of said substrate (110) (*Appellants' specification, paragraph 0036 and Figs. 6 and 7*).

Claim 51 recites:

A fuel cell comprising:

a support substrate (110) supporting a cathode (140), anode (130) and electrolyte (120) (*Appellants' specification, paragraph 026*); and

a plurality of pores (150) formed through said substrate (110) (*Appellants' specification, paragraph 026*),

wherein said pores (150) vary in diameter by tapering to a narrow point (600) between two openings, both openings being larger than said narrow point (*Appellants' specification, paragraph 0036 and Figs. 6 and 7*).

Claim 58 recites:

An apparatus comprising:

a fuel cell configured for providing power (*Appellants' specification, paragraph 026*), said fuel cell comprising:

a support substrate (110) supporting a solid cathode material (140) deposited on a first side of said substrate (110), a solid anode material (130) deposited on a second side of said substrate (110) and an electrolyte (120) (*Appellants' specification, paragraph 026*); and

a plurality of pores (150) formed through said substrate (110), said pores (150) having a size and shape formed in accordance with a pre-selected desired porosity (*Appellants' specification, paragraph 026*).

VI. Grounds of Rejection to be Reviewed on Appeal

The recent Office Action raised the following grounds of rejection:

(1) Claims 55 and 57 (actually 58) were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

(2) Claims 49, 50, 56, 58, 59, 65 and 66 were rejected as anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 3,503,808 to Agruss ("Agruss").

(3) Claims 49, 50-52, 55, 56, 58-61, 64, 70-72, 74, 75, 77-81, 83 and 84 were rejected as anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 5,234,722 to Ito ("Ito").

(4) Claims 58, 60-62, 64 and 67 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,482,792 to Faita ("Faita").

(5) Claim 76 was rejected as being unpatentable under 35 U.S.C. § 103(a) over the teachings of Ito in view of Hibino (of record).

(6) Claim 73 was rejected as being unpatentable under 35 U.S.C. § 103(a) over the teachings of Ito in view of U.S. Patent No. 6,558,831 to Doshi ("Doshi").

(7) Claim 82 was rejected as being unpatentable under 35 U.S.C. § 103(a0 over the teachings of Ito in view of Doshi.

(8) Claims 49, 51-53, 55 and 57 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Faita and U.S. Patent No. 6,051,331 to Spear ("Spear").

Accordingly, Appellants hereby request review of these grounds of rejection.

VII. Argument

(1) Claims 55 and 58 comply with 35 U.S.C. § 112, second paragraph:

In this regard, the latest Office Action states that claims 55 and 57 were rejected under § 112. However, the Action provides no discussion of claim 57, referring instead to claim 58. Consequently, Appellant must presume that the Examiner intended to reject claim 58 and not claim 57 under this heading.

Claim 55:

The recent Office Action argues that "claim 55 contracts [contradicts?] claim 49 from which it depends. It is unclear as to how pores that vary in diameter through a thickness of said substrate (claim 49) can be also 'substantially uniform in size and shape' (claim 55)." (Action , p. 6). Appellant respectfully disagrees.

Starting again with the perspective of one skilled in the art, claim 55 clearly refers to the desired characteristic that each pore of the plurality of pores is substantially the same, i.e., uniform, in size and shape as the other pores. Each of the uniform pores varies in diameter through the thickness of the substrate, as claimed. This is illustrated in each of the figures in Appellant's specification that show the plurality of pores. Consequently, there is no lack of clarity in claim 55 as erroneously alleged in the Action. For at least these reasons, the rejection of claim 55 under § 112 should not be sustained.

Claim 58:

Claim 58 recites:

> An apparatus comprising:
> a fuel cell configured for providing power, said fuel cell comprising:

> a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and
>
> a plurality of pores formed through said substrate, said pores having a size and shape formed in accordance with a pre-selected desired porosity.

According to the recent Office Action, "[i]t is unclear to the Examiner as to what constitutes 'pre-selected desired' porosity." (Office Action, p. 7). Appellants respectfully submit that no actual basis for rejecting claim 58 under 35 U.S.C. § 112 is given in this statement.

There is no reason why the "pre-selected desired porosity should be unclear. Appellants' specification clearly explains the concept of a "pre-selected desired porosity."

> The fabrication process may begin with determining the desired initial porosity characteristics of the supports structure (step 400). Average pore diameter varies with the anodization voltage used during the formation of anodic alumina. In addition, other factors such as the nature of the anodization electrolyte, electrolyte concentration, and tempore of the anodization may affect the pore diameter. Accordingly, a larger anodization voltage may be applied to the aluminum substrate where a larger average pore size is desired. Further, during formation porosity characteristics can be varied as the substrate is grown, thereby allowing for establishment of pore morphology including a plurality of pore sizes and for change in pore size with respect to the direction of substrate growth. Thus once the desired pore morphology has been determined (step 400), it may be necessary to calculate the anodization voltage profile necessary for the process to achieve the desired pore morphology (step 410).

(Appellants' specification , paragraph 0029).

In the latest Office Action, the "Examiner notes that there is no structural difference between an electrolyte with a porosity that was determined before or during or after the manufacture." (Action, p. 4). This statement is utterly unreasonable and clearly incorrect. If one of skill in the art selects a desired porosity for an electrolyte *prior to manufacture* and adjusts the manufacturing variables to produce that desired porosity, of course the resulting electrolyte will be structurally different than if the porosity were not pre-selected and controlled in this manner. Consequently, the claimed "pre-selected desired porosity" must be

given patentable weight because it inescapably produces a structural difference in the resulting product than allowing the porosity to develop at random, without pre-selection.

Consequently, despite being unclear to the Examiner, claim 58 is not indefinite and is clearly explained and supported in Appellants' specification. Therefore, the rejection of claim 58 under 35 U.S.C. § 112, second paragraph, should not be sustained.

(2) Claims 49, 50, 56, 58, 59, 65 and 66 are Patentable over Agruss:

Claim 49:

Claim 49 recites:

> A fuel cell comprising:
> a ceramic support substrate supporting a cathode, anode and electrolyte; and
> a plurality of pores formed through said substrate, *said pores having a size that varies in diameter through a thickness of said substrate.*

(Emphasis added).

In contrast, to claim 49, Agruss does not teach or suggest a fuel cell comprising a porous substrate, "said pores having a size that varies in diameter through a thickness of said substrate." There is no teaching or suggestion in Agruss of this feature of claim 49.

It is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Consequently, when the Examiner fails to identify a claimed element, the Examiner has failed to establish a prima facie case of anticipation.

Accordingly, the latest Office Action is unable to cite to any teaching or suggestion in Agruss of the claimed fuel cell comprising a porous substrate, "said pores having a size that varies in diameter through a thickness of said substrate." Rather, the latest Office Action merely alleges that Agruss teaches this subject matter with any supporting evidence or citation to the teachings of Agruss. (Aciton, p. 8).

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 49 should not be sustained.

Claim 58:

Claim 58 recites:

> An apparatus comprising:
> a fuel cell configured for providing power, said fuel cell comprising:
> a support substrate supporting *a solid cathode material* deposited on a first side of said substrate, *a solid anode material* deposited on a second side of said substrate and an electrolyte; and
> a plurality of pores formed through said substrate, said pores having a size and shape formed in accordance with a pre-selected desired porosity.

(Emphasis added).

In contrast, Agruss fails to teach or suggest the claimed porous substrate supporting a *solid* cathode material and a *solid* anode material. In this regard, reference is made to Appellants' originally-filed specification at, for example, paragraph 0039.

To the contrary, Agruss teaches away from this subject matter with a very different fuel cell chemistry in which the electrodes are *liquid (molten)*. (Agruss, col. 2, lines 25-30). Clearly, one of skill in the art can tell the difference between a solid electrode material, as claimed, and a liquid electrode material, as taught by Agruss.

As taught by Agruss: "A liquid potassium rich solution of potassium and thallium in the upper chamber 10 forms a negative electrode while a thallium rich solution of liquid potassium and thallium in the lower chamber 12 forms a positive electrode." (Agruss, col. 2, lines 25-30) (emphasis added). The Office Action according argues that "potassium and

thallium are solid materials because at temperature 173 C or below, thallium is solid (3:5-15). Thus, when the fuel cell is starting up from room temperature to its operating temperature, the fuel cell of Agruss would read on the instant claim limitations of 'a solid cathode material' and 'a solid anode material'" (Action, p. 13).

In response, Appellant agrees that the fuel cell of Agruss operates at temperatures "in excess of 335° C." (Agruss, col. 3, line 4). At such temperatures, the potassium rich and thallium rich solutions do appear to become molten and only then can the fuel cell function. (Agruss, col. 1, lines 13-17 and lines 30-33). At these elevated operating temperatures, the electrolyte (a salt, such as potassium chloride) is also liquid or molten. (Agruss, col. 3, lines 62-64). Such an electrolyte would be solid at room temperature , along with the anode and cathode. However, there is no disclosure or suggestion that the fuel cell could even operate as intended, when the anode, cathode, and electrolyte are all solid. Therefore, the soldifiedsolutions of Potassium and Thallium are *no longer an anode and cathode material* as claimed. Consequently, it is unreasonable, as the Office Action has attempted, to suggest that the liquid electrodes taught by Agruss remain electrodes and are read on by claim 58 when the fuel cell is non-functional and the liquid, or molten, solutions previously used as electrodes have solidified. Thus, Agruss fails to teach or suggest the claimed porous substrate supporting a *solid cathode material* and a *solid anode material*.

Additionally, claim 58 recites "a plurality of pores formed through said substrate, said pores having a size and shape *formed in accordance with a pre-selected desired porosity*." (Emphasis added). As noted herein, there is significant structural meaning attached to the recitation of pores having a size and shape formed in accordance with a pre-selected porosity. (*See* Sec. (1) above). In contrast, Agruss does not teach or suggest this subject matter.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, the rejection of claims 58 and 59 should not be sustained.

(3) Claims 49, 50-52, 55, 56, 58-61, 64, 70-72, 74, 75, 77-81, 83 and 84 are patentable over Ito:

Claim 49:

Claim 49 recites:

> A fuel cell comprising:
> a ceramic support substrate supporting a cathode, anode and electrolyte; and
> a plurality of pores formed through said substrate, *said pores having a size that varies in diameter through a thickness of said substrate.*

(Emphasis added).

In contrast, Ito does not teach or suggest this subject matter. Ito does not teach or suggest a ceramic support substrate with pores formed through the substrate having a size that varies in diameter through the thickness of the substrate.

Moreover, the recent Office Action fails to adequately explain how or where Ito teaches such subject matter. (Action, pp. 6-7). To the contrary, the recent Office Action completely misunderstands and misconstrues the teachings of Ito. In reality, Ito teaches away from a porous substrate like that claimed. Rather, Ito teaches a "solid electrolyte film [that] has a true porosity of not more than 5%." (Ito, abstract).

With this background, Ito states that "FIGS. 1 and 2 are scanning type electromicroscopic photographs showing the structure of the solid electrolyte films." (Ito, col. 3, lines 60-64). Thus, as would thus be clear to one of skill in the art, Figs. 1 and 2 show

the various structural components of the solid films, both a film material and a stabilizing material. Figs. 1 and 2 *do not* show pores in the "solid" film as mistakenly assumed by the Examiner.

According to the Action, "the pores are not completely spherical in shape. See fig. 1 and 2. Thus, it is noted that the pores vary in diameter … in the thickness direction." (Action, p. 6). As demonstrated above, however, there is nothing in Ito that would lead one to conclude that Figs. 1 and 2 are illustrating pore shapes, quite the contrary. Thus, the Examiner is again trying to read teachings into Ito that simply are not there.

Clearly, there is no reasonable basis on the record for reading into Ito the subject matter of claim 49, as the Office Action attempts to do. "A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 49 should not be sustained.

Claim 51:

Claim 51 recites:

> A fuel cell comprising:
> a support substrate supporting a cathode, anode and electrolyte; and
> a plurality of pores formed through said substrate,
> wherein *said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point.*

(Emphasis added).

With regard to claim 51, the Action argues that Ito teaches "pores [that] vary in diameter by tapering to a narrow point between two openings both openings being larger than

said narrow point. Refer to a portion of fig. 1 below." (Action, p. 7). Appellant has two responses. First, as demonstrated above, Fig. 1 of Ito does not show pores as erroneously presumed by the Examiner. Second, even if Fig. 1 did show pores, Fig. 1 absolutely does not illustrate the claimed pore shape with two *openings* and tapering to a narrow point between such openings.

The Examiner is again trying to read teachings into Ito that simply are not there. Clearly, there is no reasonable basis on the record for reading into Ito the subject matter of claim 51, as the Office Action attempts to do. "A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 51 should not be sustained.

Claim 58:

Claim 58 recites:

> An apparatus comprising:
> a fuel cell configured for providing power, said fuel cell comprising:
> a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and
> a plurality of pores formed through said substrate, *said pores having a size and shape formed in accordance with a pre-selected desired porosity.*

(Emphasis added).

The latest Office Action neglects to specifically address claim 58 under the rejection based on Ito and, thus, utterly fails to indicate how or where Ito teaches the subject matter of claim 58.

It is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Consequently, when the Examiner fails to identify a claimed element, the Examiner has failed to establish a prima facie case of anticipation.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 58 should not be sustained.

(4) Claims 58, 60-62, 64 and 67 are patentable over Faita:

Claim 58:

Claim 58 recites:

> An apparatus comprising:
> a fuel cell configured for providing power, said fuel cell comprising:
> a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and
> a plurality of pores formed through said substrate, *said pores having a size and shape formed in accordance with a pre-selected desired porosity*.

(Emphasis added).

In contrast, Faita utterly fails to teach or suggest this subject matter. According to the misguided Office Action, Faita "discloses [a] plurality of pores 2 or 9) and 3 (or 11) (fig. 2 and 3) formed through the bipolar plate or the gasket. These pores taper to a narrow point between the openings." (Action, p. 8). This is a complete misreading of what Faita teaches.

According to Faita, "the bipolar plate (1) is made of a metal plate which may have a flat surface in the area of contact with the collector (14). The peripheral frame area of the

bipolar plate (1) is provided with holes (2) and optionally with distribution channels (3) for the inlet and outlet of the gasses." (Faita, col. 5, lines 53-58). Thus, Faita teaches a bipolar plate ***at the outside of*** an electrochemical cell (See Fig. 1) with holes for admitting gases to the enclosed electrochemical cell.

Consequently, the bipolar plate (1) of Faita to which the Action refers is clearly not "a support substrate supporting *a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate* and an electrolyte," as recited in claim 58. (Emphasis added). The Action fails to point to any such substrate in the teachings of Faita that also includes the plurality of pores as claimed. Moreover, one of skill in the art would never confuse the gas pathway holes in a metal plate taught by Faita with the claimed pores having a size and shape formed in accordance with a pre-selected desired porosity, as recited in claim 58.

Thus, Faita clearly fails to teach or suggest the subject matter of claim 58. "A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Faita of claim 58 and its dependent claims should be reconsidered and withdrawn.

(5) Claim 76 is patentable over Ito and Hibino:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 58. Therefore, this rejection of claim 76 should not be sustained.

(6) Claim 73 is patentable over Ito and Doshi:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 49. Therefore, this rejection of claim 73 should not be sustained.

(7) Claim 82 is patentable over Ito and Doshi:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 58. Therefore, this rejection of claim 82 should not be sustained.

(8) Claims 49, 51-53, 55 and 57 are patentable over Faita and Spear:

Claim 49:

Claim 49 recites:

> A fuel cell comprising:
> a ceramic support substrate supporting a cathode, anode and electrolyte; and
> a plurality of pores formed through said substrate, *said pores having a size that varies in diameter through a thickness of said substrate.*

(Emphasis added).

According to the most recent Office Action, "Faita discloses a bipolar plate (applicant's substrate) that supports a cathode, anode, and an electrolyte. See Fig. 1." (Action, p. 11). However, as demonstrated above, this is a complete misreading of what Faita teaches.

According to Faita, "the bipolar plate (1) is made of a metal plate which may have a flat surface in the area of contact with the collector (14). The ***peripheral*** frame area of the bipolar plate (1) is provided with holes (2) and optionally with distribution channels (3) for the inlet and outlet of the gasses." (Faita, col. 5, lines 53-58) (emphasis added). Thus, Faita teaches a bipolar plate ***at the outside*** of an electrochemical cell (See Fig. 1) with holes for admitting gases to the enclosed electrochemical cell. Consequently, the bipolar plate (1) of

Faita to which the Action refers is clearly not a "support substrate supporting a cathode, anode and electrolyte," as recited in claim 49.

Moreover, one of skill in the art would never confuse the gas pathway holes in a metal plate taught by Faita with the claimed pores having a size that varies in diameter through a thickness of said substrate, as recited in claim 49. It is an utterly unreasonable twisting of the term "pore" to apply the term to holes and channels cut into a metal substrate. Thus, Faita clearly fails to teach or suggest the subject matter for which it is cited by the Action in rejecting claim 49.

Continuing, the Action concedes that Faita does not teach a "ceramic" support substrate, as recited in claim 49. Consequently, the Action cites Spear arguing that "Spear teaches a bipolar plate made of ceramics (3:37). It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Faita's bipolar plate of metal with Spear's ceramic bipolar plate because it has been held by the court that the selection of a known material based on its suitability for its intended use is 'prima facie obvious. Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945). Se [sic] MPEP 2144.07." (Action, p. 11). This attempted combination of prior art teachings fails for at least two reasons.

First, while Spear mentions a ceramic plate, Spear does not teach or suggest how to form "pores [in the ceramic substrate] having a size that varies in diameter through a thickness of said substrate." Faita is no help on this subject as Faita merely teaches much larger channels for carrying gases cut into a metal substrate. Thus, the combination of Spear and Faita fails to enable the fuel cell recited in claim 49. "In order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547,

1551, 13 U.S.P.Q.2d 1301, 1304 (Fed. Cir. 1989); *In re Payne*, 606 F.2d 303, 314, 203 U.S.P.Q. 245, 255 (CCPA 1979). For at least this reason, the rejection of claim 49 should not be sustained.

Second, the Office Action provides no valid reason why one of skill in the art would have combined the teachings of Faita and Spear. According to the Action, "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Faita's bipolar plate of metal with Spear's ceramic bipolar plate because it has been held by the court that the selection of a known material based on its suitability for its intended use is'prima facie obvious." (Action, p. 11). The Action can make this conclusory and unsupported statement because the Action is ignoring the substance of claim 49. Faita teaches a peripheral metal frame through which gases flow to and from a fuel cell. Spear does not teach or suggest a ceramic plate for this purpose. Thus, the "suitability" of Spear's ceramic for the intended use of Faita's metal frame is not supported by any evidence on the record.

In a recent decision, the Board of Patent Appeals and Interferences stated the following:

> The Examiner's articulated reasoning . . . in the rejection must possess a rational underpinning to support the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). The Supreme Court, reiterating this reasoning by citing *In re Kahn*, 441 F.3d at 988, stating that 'rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.' *KSR* at 1741.

Ex Parte Val Mandrusou, Application Serial No. 10/235,221, 2008 WL 2845083 (B.P.A.I. 2008).

Consequently, the Action utterly fails to carry the burden imposed on Examiner's by the Supreme Court in *KSR* and, thus, fails to make a *prima facie* case of obviousness as to claim 49.

Therefore, as demonstrated here, the combination of Faita and Spears both fails to teach or suggest all the claimed subject matter, fails to enable the claimed subject matter and has not been properly combined by the Examiner. For any and all of these reasons, the rejection of claim 49 should not be sustained.

Claim 51:

Claim 51 recites:

> A fuel cell comprising:
> a support substrate supporting a cathode, anode and electrolyte; and
> a plurality of pores formed through said substrate,
> *wherein said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point.*

(Emphasis added).

The rejection of claim 51 based on Faita and Spear should not be sustained for the same reasons given above with respect to claim 49.

Additionally, claim 51 recites "wherein said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point." In contrast, this subject matter is not taught or suggested by the combination of Faita and Spear. There is no teaching or suggestion of the claimed pores and their tapered shape in either Faita or Spear.

Moreover, the recent Office Action utterly fails to address this aspect of claim 51. The Action fails to indicate how or where the cited prior art teaches this element of claim 51.

The test for determining if a claim is rendered obvious by one or more references for purposes of a rejection under 35 U.S.C. § 103 is set forth in *KSR International Co. v. Teleflex Inc.*, 550 U.S._, 82 USPQ2d 1385 (2007):

> "Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." Quoting *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966).

Consequently, the recent Office Action fails to resolve the factual inquires required by *KSR* and *Graham*, namely the differences between the cited prior art and the claimed subject matter. The Action fails to indicate how or where the cited prior art teaches the pores recited in claim 51 that "vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point." For at least this reason, the deficient rejection of claim 51 cannot be sustained.

Claim 57:

Claim 57 recites "wherein said substrate comprises a second plurality of substantially uniform pores formed through said substrate wherein an average size of said second plurality of pores is smaller than said first plurality of pores." As with claim 51 above, the recent Office action fails to indicate how or where this subject matter is taught by the cited prior art of Faita and Spears. Consequently, the recent Office Action fails to resolve the factual inquires required by *KSR* and *Graham*. For at least this reason, the deficient rejection of claim 51 cannot be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of July 11, 2007 is respectfully requested.

Respectfully submitted,

DATE: November 20, 2008

/Steven L. Nichols/
Steven L. Nichols
Registration No. 40,326

Steven L. Nichols, Esq.
Managing Partner, Utah Office
Rader Fishman & Grauer PLLC
River Park Corporate Center One
10653 S. River Front Parkway, Suite 150
South Jordan, Utah 84095
(801) 572-8066
(801) 572-7666 (fax)

VIII. CLAIMS APPENDIX

1-48. (cancelled)

49. (previously presented) A fuel cell comprising:

a ceramic support substrate supporting a cathode, anode and electrolyte; and

a plurality of pores formed through said substrate, said pores having a size that varies in diameter through a thickness of said substrate.

50. (original) The fuel cell of claim 49, wherein said electrolyte is deposited in said pores.

51. (previously presented) A fuel cell comprising:

a support substrate supporting a cathode, anode and electrolyte; and

a plurality of pores formed through said substrate,

wherein said pores vary in diameter by tapering to a narrow point between two openings, both openings being larger than said narrow point.

52. (original) The fuel cell of claim 49, wherein said pores branch within said substrate.

53. (previously presented) The fuel cell of claim 52, wherein branching of said pores results in a greater number of pore openings on a first side of said substrate than on a second side of said substrate.

54. (original) The fuel cell of claim 53, wherein said anode is disposed on said first side of said substrate and said cathode is disposed on said second side of said substrate.

55. (previously presented) The fuel cell of claim 49, wherein said pores are substantially uniform in size and shape.

56. (original) The fuel cell of claim 49, wherein said substrate comprises alumina.

57. (previously presented) The fuel cell of claim 55, wherein said substrate comprises a second plurality of substantially uniform pores formed through said substrate wherein an average size of said second plurality of pores is smaller than said first plurality of pores.

58. (previously presented) An apparatus comprising:

a fuel cell configured for providing power, said fuel cell comprising:

a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and

a plurality of pores formed through said substrate, said pores having a size and shape formed in accordance with a pre-selected desired porosity.

59. (original) The apparatus of claim 58, wherein said electrolyte is deposited in said pores.

60. (original) The apparatus of claim 58, wherein said pores vary in diameter along a thickness of said substrate.

61. (original) The apparatus of claim 58, wherein said pores branch within said substrate.

62. (original) The apparatus of claim 61, wherein branching of said pores results in a greater number of pore openings on a first side of said substrate than on a second side of said substrate.

63. (original) The apparatus of claim 62, wherein said anode is disposed on said first side of said substrate and said cathode is disposed on said second side of said substrate.

64. (original) The apparatus of claim 58, wherein said pores are formed in parallel through said substrate.

65. (original) The apparatus of claim 58, wherein said substrate comprises a ceramic.

66. (original) The apparatus of claim 58, wherein said substrate comprises alumina.

67. (original) The apparatus of claim 58, wherein said substrate comprises a second plurality of pores formed through said substrate wherein an average size of said second plurality of pores is smaller than said first plurality of pores.

68. (previously presented) The fuel cell of claim 49, wherein said pores provide an open passageway through said substrate with said electrolyte being deposited on sides of interiors of said pores.

69. (previously presented) The fuel cell of claim 68, wherein each pore comprises a layer in which said electrolyte is mixed with a material of said substrate, said layer being between said electrolyte said substrate.

70. (previously presented) The fuel cell of claim 49, wherein said cathode comprises perovskite.

71. (previously presented) The fuel cell of claim 70, wherein said cathode comprises lanthanum manganite.

72. (previously presented) The fuel cell of claim 49, wherein said anode comprises a ceramic/metal composite.

73. (previously presented) The fuel cell of claim 72, wherein said anode comprises nickel and yttria-stabilized zirconia cermet.

74. (previously presented) The fuel cell of claim 49, wherein said electrolyte comprises at a zirconia-based electrolyte.

75. (previously presented) The fuel cell of claim 74, wherein said electrolyte comprises at least one of yttria-stabilized zirconia, gadolinium-doped ceria, $Ba_2In_2O_5$, or a (strontium, magnesium)-doped $LaGaO_3$ (LSGM).

76. (previously presented) The apparatus of claim 58, wherein said fuel-cell is a single chamber fuel cell.

77. (previously presented) The apparatus of claim 58, wherein said pores provide an open passageway through said substrate with said electrolyte being deposited on sides of interiors of said pores.

78. (previously presented) The apparatus of claim 77, wherein each pore comprises a layer in which said electrolyte is mixed with a material of said substrate, said layer being between said electrolyte said substrate.

79. (previously presented) The apparatus of claim 58, wherein said cathode comprises perovskite.

80. (previously presented) The apparatus of claim 79, wherein said cathode comprises lanthanum manganite.

81. (previously presented) The apparatus of claim 58, wherein said anode comprises a ceramic/metal composite.

82. (previously presented) The apparatus of claim 81, wherein said anode comprises nickel and yttria-stabilized zirconia cermet.

83. (previously presented) The apparatus of claim 58, wherein said electrolyte comprises at a zirconia-based electrolyte.

84. (previously presented) The apparatus of claim 83, wherein said electrolyte comprises at least one of yttria-stabilized zirconia, gadolinium-doped ceria, $Ba_2In_2O_5$, or a (strontium, magnesium)-doped $LaGaO_3$ (LSGM).

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None